ANALOX 5001 – Carbon Dioxide Monitor

User Manual

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IMPORTANT SAFETY WARNINGS

THIS PAGE SHOULD BE READ AND UNDERSTOOD BY ALL PERSONNEL CONCERNED WITH THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS INSTRUMENT.

The Instruments in the 5001 Range are **NOT** suitable for operation in a Hazardous Area, as defined by the British Standard BS 5345 Part 4.

ELECTRICAL SHOCK HAZARD WARNING

THIS EQUIPMENT MUST BE EARTHED

The electrical power used in the 5001 System may be at a voltage sufficient to endanger life. Before carrying out any maintenance or repair, persons concerned must ensure that the equipment is disconnected from any Mains supply and tests made to ensure that isolation is complete.

When the supply cannot be disconnected, functional testing, maintenance or repair should only be undertaken by qualified persons, who are aware of the precautions necessary when carrying out such operation.

ANALOX 5001 'WARM-UP' PERIOD

The Infra-Red sensor used in this Instrument requires a short initial settling period when power is first applied. The monitoring Instrument display will show a negative reading and the front panel **SENSOR STATUS** LED should flash on and off at regular intervals. This is a perfectly normal condition and after about 40 Seconds, the Instrument will automatically display the normal measured value of CO_2.

ELECTRICAL

Ranges Available:	0 - 10000ppm 0.0001 - 1% CO_2 0.0001 - 2% CO_2 0.001 - 5% CO_2 0.001 - 10% CO_2 0.1 - 100% CO_2
Sensor Type:	Low Power Infra Red
Accuracy:	±3% full scale at constant temperature and pressure. Or ±0.5% of full scale at constant temperature and pressure assuming regular calibration (e.g. at start of each 8 hour operating period).
Response Time:	30 Seconds to T90
Operating Temperature:	-5 to 40 ^oC
Temperature Effect:	<0.1% FS/^oC
Zero Drift:	<1% FS / week
Warm up Time:	40 Seconds
Orientation:	Not Sensitive
Gas Flow Rate:	500 millilitres/minute
Pressure Effects:	0.15% of reading per millibar
Operating Pressure:	+/-5psig +/-350mbarg (nominal)
Display:	4.5 Digit High-Brightness Red LED
Power Supply:	85 to 264 VAC, 47 to 63 Hz 12v to 32v DC Max Ripple 1v
Outputs:	0 – 1 Volt minimum load 10K ohms Plus 4 – 20mA Internally powered
Alarm Relays:	2 x Single Pole C/O Rated 1Amp 30V DC Energised in Alarm
Optional Extras:	Battery Back Up
Operating Temperature:	-5 – 40^oC
Storage Temperature:	-20 to + 70^oC
Relative Humidity:	95% at 40^oC Non. Condensing

DISPOSAL

According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.

OPERATING INSTRUCTIONS FOR ANALOX 5001

These instructions should be read and understood by all individuals who will be responsible for operation of this Analyser. The actions taken as a result of the measured levels must be in strict accordance with the Company and Government Regulations.

INTRODUCTION

The Analox 5001 Carbon Dioxide Analyser provides a continuous digital display of concentration CO_2 in the gas sample flowing through the sensor unit. The instrument displays the measured value on a 4.5 Digit red LED display and may be supplied to read over the ranges as described on page 3 of this manual. The resolution of the display on the % range instruments can be selected by the user. The transducer used in the instrument is the Analox 5SA single beam, single wavelength device, wavelength selection being achieved by a carefully specified narrow band optical filter. The source is pulsed to give an Infra-red carrier signal, which is attenuated by the Infra-red absorption of Carbon Dioxide and a microprocessor controlled detection system converts changes in this attenuation into an electrical output.

The Instrument is easy to calibrate, using the 'ZERO' and 'CAL' adjustments on the front panel. User adjustable, two stage high audio/visual alarms, together with relays, are fitted as standard and these may be adjusted over the full range of the instrument. The relay outputs are available on the Instrument rear panel. A flowmeter, which incorporates a controlling needle valve, is mounted on the front panel of the Instrument. The instrument will operate from 110 Volts AC to 240 Volts AC (universal).

OPERATING CONDITIONS

The sample gas to be measured must meet the following conditions:

Flowrate: 500ml/min (30 ltr/hr)
Pressure: $\pm$ 5 psi Gauge (+ 350 mbar Gauge)

If the instrument is to be used in particularly dust-laden atmospheres then the filter should be examined regularly and changed as necessary.

NOTE: IT IS IMPORTANT THAT THE SENSOR EXHAUSTS TO ATMOSPHERIC PRESSURE.

Under no circumstances should any other equipment or restriction be connected to the exhaust port since any resultant back pressure will affect the accuracy of the readings obtained.

ANALOX
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CALIBRATION

To ensure optimum performance, the instrument should have been switched on for at least 2 Hours, before any calibration adjustments are made.

1. Setting Zero

Connect a 'Zero Gas,' ie Helium or Nitrogen and adjust the flowrate to approximately 500ml/min (30ltr/hr). Allow a few minutes for the reading to stabilise and when steady, adjust the front panel 'ZERO' trimmer until the display reads '0000', ± the least significant digit.

2. Span Adjustment

Connect a Calibration gas of known CO_2 concentration, it is recommended this be at least 50% of the sensor range.

THE GAS USED DURING SPAN CALIBRATION, MUST HAVE THE SAME BALANCE COMPONENT AS THAT WHICH WILL BE USED DURING SUBSEQUENT ANALYSIS – ie if a Helium/Oxygen mixture is normally used then the Span adjustment must be done with a Helium/CO_2 mix Calibration gas. Adjust the flowrate to approx. 500ml/min (30ltr/hr) and wait until the reading is steady (+/- digit). Adjust the 'CAL' trimmer until the reading agrees with the calibration gas CO_2 concentration. Turning the trimmer Clockwise increases the displayed reading.

ALARM OPERATION

The Instrument is fitted with a Two stage alarm system. Both operate when the CO_2 concentration EXCEEDS the set points. If a 'Hi 1' alarm condition occurs, the internal audible buzzer will sound intermittently and the yellow 'HORN' LED will flash, to indicate which alarm level has been exceeded. The audible alarm can then be silenced by pressing the 'MUTE' button; this action will also turn off the yellow 'HORN' LED. If the reading is still in an alarm condition, the red 'HI 1' LED will continue to flash until CO_2 concentration returns below the HI 1 Set point. The red LED will then turn off. If a 'HI 2' alarm condition occurs, the action is similar to that described above except that the audible alarm is a continuous tone rather than intermittent. If an alarm condition occurs and the CO_2 concentration returns to normal before the 'MUTE' button is pressed, then the audible and visual alarms described above, will continue to be active until the 'MUTE' button is pressed. This facility allows the operator to be aware of any alarm occurrence whilst the instrument was unattended. The alarms have a built-in Hysteresis of approximately 0.25% of full scale to overcome 'nuisance' triggering when measuring near the set points.

ALARM SETTING

Before any Adjustments are made to the 'SET ALARM' controls, the operator should release the locks on the knobs. This is done by moving the small lever located at the edge of the control until the knob turns freely. After adjustment, the locks should be reset in order to prevent accidental movement. The SET HI 2/SET HI 1 toggle switch is normally biased to its central position to read the measured CO_2 level. The High 2 alarm point is set by moving this switch upward and adjusting the 'SET HI ALARM 2' control knob until the desired High alarm trip level is displayed. The HI 1 alarm trip point is set by moving the switch downward and

adjusting the 'SET HI ALARM 1' control knob until the desired level is displayed. If the operator only requires to check the currently set alarm points this may be done by just pressing the 'SET HI 2'/'SET HI 1' switch to the appropriate position, and reading the levels on the LED Display.

INTERFERENCE

Whilst all reasonable precautions have been taken within the Instrument circuitry and the case is RF screened, it is still possible, in common with other instruments, that very strong, local Radio Frequency fields could cause interference. This will show up as erratic readings on the LED Display. Where possible, RF sources such as Portable Radio Transmitters or Telephones should not be operated very close to the instrument.

INSTALLATION

THE ANALOX 5001 Instruments are available in two forms:

1. Suitable for insertion in a 19 inch rack frame,
2. Suitable for direct mounting in an existing instrument panel.

For details of dimensions, cut outs and mounting centres, refer to the Mechanical Specifications Pages at the end of this handbook. The frame mounting version should be inserted in a suitable rack and secured by the 4 corner screws and bushes, supplied with the instrument. Refer to the connection details below. When fitting the Panel mounting Instrument, the screws and bushes should be left attached to the instrument, as supplied and the whole assembly inserted into the panel, easing the bushes into the 10mm holes. Tightening the 4 screws will expand the bushes, locking them into the panel. If the instrument is subsequently removed from the panel, it is only necessary to remove the screws – the bushes should remain captive in the panel.

REAR PANEL CONNECTIONS

All Electrical Inputs to and outputs from the Instrument are connected via various sockets and terminals on the rear panel of the Instrument. All connections are identified by labels on the rear panel but are repeated here for convenience.

Power Supply

WARNING THIS EQUIPMENT MUST BE EARTHED

Only use supplied mains lead for mains connection.
Replace fuse in plug with same type (5A).
Disconnect from mains supply before removing any covers.

Power for the instrument may be derived from 1 of 2 options:

1 AC power in the range 85 to 264 VAC, 47 to 63 Hz and connected via a standard IEC 3 pin plug/socket. A suitable lead is supplied with the instrument. Note that NO voltage selection is required when using this input – the instrument will operate from

any voltage within the stated range. The fuse for this power input is mounted in the rear panel and is rated at 1 Amp 'T' type.

2 Low voltage DC in the range 12v to 32v with a ripple not exceeding 1 volt and connected via the battery charger type connector or the 2 way screw terminal type connector. THE LOW VOLTAGE DC SUPPLY SHOULD BE EXTERNALLY FUSED at a rating of 1 Amp using a 'T' type delay fuse. Note that connection polarity is important when using the DC input.

Signal Inputs and Outputs

All signal inputs and outputs are made to removable, screw terminal plugs. The main connector is located down the right side of the rear panel, when viewed from the rear. The sensor signal will normally be connected to terminals 10 and 12, pin 12 being +ve and pin 10 being –ve. The cable screen should be attached to the instrument case via the spade connector.

IMPORTANT: PINS 15 AND 16 SHOULD BE LINKED TOGETHER. Other signal inputs are not used on this Instrument. Two Analogue outputs, proportional to the measured input signal are available from the Instrument. Pin 8 provides 0-1 Volt representing 0 to Full scale and Pin 9 provides a 4-20 mAmp current output representing 0 to full scale. Pin 7 is the Common connection for both outputs. The Voltage output must **NOT** be connected to a load less than 10,000 Ohms. The Current output is powered from an internal nominal 24 Volt supply and can operate into a load from 50 Ohms to 500 Ohms.

ALARM RELAYS

All Instruments in the ANALOX 5001 Range are normally fitted with two relays which operate in conjunction with the HI and LO alarms. The relays have single pole changeover contact arrangement, rated to switch up to 1 Amp at 30V DC. The relays may be configured to be energised or de-energised, when the Instrument is in a non-alarm state. If the relays are configured to be in a normally energised state, this will provide a 'Fail-Safe' facility in that a total power failure will cause the relays to release and signal an alarm condition. Contact arrangement is shown on the rear panel. Instruments normally leave the factory with the relays configured to ENERGISE IN ALARM conditions. The 'COM' and 'NO' contacts will close, in an alarm condition.

REPAIR AND SERVICE

Apart from periodic recalibration, the Instrument has been designed to provide long, trouble-free service. However, in the event of a fault condition arising, contact your local distributor or AST Ltd, who's address, telephone and email details appear on the front page of this handbook. The Instrument contains complex, precision circuitry which requires special test equipment to ensure correct internal set-up and calibration. Internal repairs or adjustments by the user are therefore NOT recommended. A separate technical manual may be purchased by approved service centres, from AST Ltd.

SENSOR STATUS LED

This indicator is mounted on the front panel of the instrument and has three modes of operation, depending on the condition of the Infra-Red sensor system.

Normal Operation is indicated by a regular flashing On/Off.
An Internal Detector fault is indicated if the LED is permanently ON.
An Internal IR Source fault is indicated if the LED is permanently OFF.

In the event of a fault condition being indicated, contact AST Ltd for further advice.

AST LTD. WILL NOT ACCEPT RESPONSIBILITY FOR ANY EVENTS OCCURING AS A RESULT OF UNAUTHORISED ADJUSTMENTS OR REPAIRS TO THE INSTRUMENT.

The external gas filter should be checked periodically, examined for contamination and changed if thought necessary. Replacement filters may be obtained form AST Ltd by quoting part number 2377-6102.

MECHANICAL SPECIFICATION ANALOX 5001

Dimensions

Rack Mounting Version

Depth Overall:	235mm
Depth behind Panel:	300mm (min)
Height Overall:	129mm (3U)
Width Overall:	212mm (1/2 Rack)
Weight:	2.0 Kg

Panel Mounted Version

Depth Overall:	235mm
Depth (behind panel):	300mm (min)
Height Overall:	133mm
Width Overall:	240mm
Weight:	2.0 Kg

Panel Cut-out Aperture

Height:	112.5mm
Width:	224.00mm

Mounting Centres

Holes:	4 x 10mm
Height:	122.5mm
Width:	211.4mm
Centred on Cut-out	